
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

1/31/2013

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 856-6094 REVISION 3
SRP SECTION: 03.07.02 – Seismic System Analysis
APPLICATION SECTION: 3.7.2
DATE OF RAI ISSUE: 10/24/11

QUESTION NO. RAI 03.07.02-167:

In Subsection 3.1 of MUAP-11011(R0), "SSSI Analysis Methodology," the 2nd paragraph (Page 5) states "The analyses of SSSI effects of the PS/B, R/B Complex and A/B use surface-supported foundation models that neglect the effect of foundation embedment. Due to the large coupled ACS SASSI (Reference 6) models involved, neglecting the embedment effect is currently the only viable approach that can be used to study such SSSI effects."

However, the applicant did not address the effects of certain physical plant parameters (i.e., embedment and high water table) explicitly in the proposed approach. The applicant is requested to explain the potential impact of neglecting the effect of these physical parameters on the accuracy of the SSSI effects on the design basis of standard plant SSCs.

ANSWER:

Technical Report MUAP-11011, Rev. 0 has been superseded and the relevant information on the soil-structure-soil interaction analysis methodology has been incorporated into Technical Report MUAP-10006, Rev. 3.

The seismic design basis for the US-APWR has been updated to perform soil-structure interaction (SSI) analyses using dynamic finite element (FE) models of the reactor building (R/B) complex, which consists of the R/B, prestressed concrete containment vessel (PCCV), containment internal structure (CIS), power source buildings (PS/Bs), auxiliary building (A/B), and essential service water pipe chase (ESWPC) supported on a combined basemat. Subsections 03.3.3 and 03.3.4 of Technical Report MUAP-10006, Rev. 3 discuss the structure-soil-structure interaction (SSSI) analysis approach, and the results from the SSSI analyses are documented in Subsection 03.4.1.3 of the same report. Since the PS/Bs and A/B are no longer standalone buildings and are part of the R/B complex, the only SSSI effect is the influence of the T/B on the R/B complex.

The SSI and SSSI analyses of the US-APWR standard plant consider embedment. The analyses are performed with the basement perimeter walls bonded with the side soils. See Subsections 03.3.1 through 03.3.4 of Technical Report MUAP-10006, Rev. 3, for additional details.

A study on the effects of ground water table fluctuations on the seismic responses of the R/B complex is performed and documented in Technical Report MUAP-11007, Rev. 2. The conclusion of the study was that the effects of ground water fluctuations on the seismic design basis response are minor, and that the use of saturated soil profiles as a site independent analysis parameter will result in a standard plant design that envelopes the seismic demands at a large number of candidate sites. As stated in Section 2.1 of Technical Report MUAP-11007, Rev. 2, it has also been determined that SSI responses, using unsaturated soil conditions, will not be amplified by SSSI effects. Therefore, SSSI analysis with unsaturated soil conditions is not performed.

Impact on DCD

There is no impact on the DCD.

Impact on R-COLA

There is no impact on the R-COLA.

Impact on S-COLA

There is no impact on the S-COLA.

Impact on PRA

There is no impact on the PRA.

Impact on Technical/Topical Report

There is no impact on the Technical/Topical Report.

This completes MHI's response to the NRC's question.